Fall 9-2015

# GEO 225.01: Earth Materials

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# GEO 225: Earth Materials
# Fall 2015

Instructor: Julie Baldwin
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Office Hours: WF11-12pm, or by appt.

TA: Marques Hatfield
Office: CHCB 344
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Office Hours: T1-2PM, W3-5pm

Lecture Meetings: MWF 10:10-11:00 am in CHCB 304

Lab Meetings: Thurs. 11:10 am-1:00 pm in CHCB 348 and/or 110

Course prerequisites: C- or better in GEO101/102 and C- or better in CHMY141.

Course Website: We will use Moodle for this course (https://moodle.umt.edu). Please check site for course announcements, lecture notes, and handouts.

Course Overview: This course will introduce you to Earth materials, including their composition, structure, classification, and formation. Minerals are the building blocks of rocks and therefore help geologists interpret how the Earth formed and has evolved through time, making the study of minerals central to all disciplines in geology. A major goal of this course is to provide you with the necessary framework to understand and evaluate the information that minerals can provide about Earth processes and Earth history. Minerals are, of course, also important for understanding present-day Earth processes and have many practical uses in our society.

Learning Outcomes:

- Describe crystal chemistry and crystal structure and how these relate to a mineral's physical properties.
- Identify important rock-forming minerals in hand sample and thin section and explain where they are found and why.
- Explain what tools are used to identify and characterize minerals.
- Explain how minerals form, what factors affect their stability, and why certain minerals form in association with other minerals in greater (or lesser) abundances.
- Describe mineral occurrences in relation to the rock cycle. Know the common minerals in igneous, sedimentary, and metamorphic rocks, as well as in economic ore deposits.

Textbook & Materials:

- *Earth Materials*, 1st ed., Klein & Philpotts; ISBN: 978-0-521-14521-3
- i>clicker+, W.H. Freeman; ISBN: 978-1-4641-2015-2
- Index cards (pack of 100)
- Bring to every class: i>clicker (for lecture), notebook, 3-ring binder, pencil, colored pencils, straight-edge ruler, calculator, hand lens (for lab)

i>clickers

You are required to purchase an i>clicker remote for in-class participation. i>clicker is a classroom response system that allows you to respond to questions posed during class.

- i>clickers will be used during every lecture. You are responsible for bringing your remote daily – handwritten responses will not be accepted. You will receive credit for each question answered; the number of questions posed may vary from day to day.

- In order to receive credit, you will need to register your i>clicker remote online before the start of class on **Sept. 9**. To register your i>clicker, go to https://www1.iclicker.com/register-clicker/. Complete the fields with your first and last names (use your official university name), **NetID** (for Student ID box), and remote ID (see registration page for location).

Lab: You are required to attend lab each week. Expect lab assignments to require significantly more time for completion than is available during the formal lab period. Lab assignments will be due at the beginning of the following lab period. ***A penalty of 20% PER DAY an assignment is late will apply***. No lab assignments will be accepted for credit after the assignment has been graded and returned. There will be a lab midterm and a comprehensive lab final. Your TA will provide you with detailed information regarding lab assignments and expectations.

Exams: There will be three midterms and a final exam in lecture. You may use your i>clicker average to replace your lowest midterm grade IF your i>clicker average is equal to or greater than 85%. You may not replace the grade of a midterm exam not taken. This is your incentive to come to class and participate, since midterm averages are typically in the 60s for this course.

Mineral Mastery Quiz: You must have the appropriate skills and knowledge to think intelligently about the rocks you come across. Thus, it is to your benefit to be able to identify common minerals (using appropriate diagnostic tools) and to know the mineral formulas or general chemical compositions of these minerals.

- You will be provided with a list of ~60 minerals. You will identify and describe each of these minerals before taking a quiz on their identification and compositions.
- Scores on the Mineral Mastery quiz below 85% will not receive credit. You may have up to five attempts to complete the quiz.
- This task will primarily be completed outside of formal lecture/lab periods.
- You will receive detailed instructions on completing the Mineral Mastery quiz during the second week of the semester.

Field Trip: There will be a required field trip for this class. Details will be announced within the next couple of weeks. Please make scheduling arrangements accordingly.

Grading: Your final grade will be based on the following grading scheme:

| | |
|---|---|
| Midterm Exams | 25% |
| Final Exam | 15% |
| i>clicker participation | 10% |
| Lab Assignments | 25% |
| Lab Midterm | 5% |
| Lab Final | 10% |
| Mineral Mastery Quiz | 10% |

Communication: Please note that I will only use your official UM email to communicate with you. This is required to comply with FERPA (the Federal Educational Rights and Privacy Act). Email is the preferred way to contact me – voicemail will take longer to reach me. It is your responsibility to make sure you read messages sent to your UM email address in a timely manner.

Success: Your academic achievement naturally depends on your engagement in this course. You will improve your chances of success if you: complete readings and assignments; actively attend (and be engaged in) lectures and labs; take advantage of office hours and review sessions; participate in activities and discussions; make use of available resources; and ask questions. Do not hesitate to ask for help. I am always happy to assist you, but it is your responsibility to seek help from me (or your TA) when you need it.

Policy for late work:
If you are having trouble completing an assignment on time, please come talk to me or the TA AHEAD of the due date. Otherwise, ***a penalty of 20% per day an assignment is late will apply***.

Disabilities:
*The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students. If you think you may have a disability adversely affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or 406.243.2243. I will work with you and Disability Services to provide an appropriate modification.*

Academic Integrity:
*All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University.*
*All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://life.umt.edu/vpsa/student_conduct.php.*

| FALL 2015 SCHEDULE | | | | | |
|---|---|---|---|---|---|
| Week | Date | | Lecture Topic | Reading | Lab Topic |
| 1 | Aug. | 31 | Introduction | Ch. 1 | |
| | Sept. | 2 | Minerals, Rocks, and Plate Tectonics | Ch. 2 | Lab 1: Physical Properties |
| | | 4 | Chemistry Review | Ch. 3 | |
| 2 | | 7 | **LABOR DAY** | | |
| | | 9 | Mineral Identification | Ch. 3 | Lab 2: Mineral Identification |
| | | 11 | Mineral Identification | Ch. 3 | |
| 3 | | 14 | Mineral Identification | Ch. 3 | |
| | | 16 | Crystal Structures | Ch. 4 | Lab 3: Instrumental Techniques - SEM |
| | | 18 | Crystal Structures | Ch. 4 | |
| 4 | | 21 | Crystal Structures | Ch. 4 | |
| | | 23 | Crystal Structures | Ch. 4 | Lab 4: CrystalMaker Software |
| | | 25 | Crystallography | Ch. 5 | |
| 5 | | 28 | Crystallography | Ch. 5 | |
| | | 30 | Crystallography | Ch. 5 | Lab 5: Instrumental Techniques - XRD |
| | Oct. | 2 | **EXAM 1 (Ch. 1-5)** | | |
| 6 | | 5 | Optical Mineralogy | Ch. 6 | |
| | | 7 | Optical Mineralogy | Ch. 6 | Lab 6: Optical Properties |
| | | 9 | Optical Mineralogy | Ch. 6 | |
| 7 | | 12 | Optical Mineralogy | Ch. 6 | |
| | | 14 | Igneous Minerals | Ch. 7 | Lab 7: Optical Mineral ID |
| | | 16 | Igneous Minerals | Ch. 7 | |
| 8 | | 19 | Igneous Minerals | Ch. 7 | |
| | | 21 | Igneous Processes | Ch. 8 | **Lab Midterm** |
| | | 23 | Igneous Processes | Ch. 8 | |
| 9 | | 26 | Igneous Rocks | Ch. 9 | |
| | | 28 | Igneous Rocks | Ch. 9 | Lab 8: Igneous Minerals |
| | | 30 | **EXAM 2 (Ch. 6-9)** | | |
| 10 | Nov. | 2 | Sedimentary Minerals | Ch. 10 | |
| | | 4 | Sedimentary Processes | Ch. 11 | Lab 9: Igneous Rocks |
| | | 6 | Sedimentary Processes | Ch. 11 | |
| 11 | | 9 | Sedimentary Rocks | Ch. 12 | |
| | | 11 | **VETERANS DAY** | | Lab 10: Sedimentary Minerals |
| | | 13 | Sedimentary Rocks | Ch. 12 | |
| 12 | | 16 | Metamorphic Minerals | Ch. 13 | |
| | | 18 | Metamorphic Minerals | Ch. 13 | Lab 11: Sedimentary Rocks |
| | | 20 | Metamorphic Minerals | Ch. 13 | |
| 13 | | 23 | **EXAM 3 (Ch. 10-13)** | | |
| | | 25-27 | **THANKSGIVING BREAK** | | **NO LAB THIS WEEK** |
| 14 | | 30 | Metamorphic Rocks | Ch. 14 | |
| | Dec. | 2 | Metamorphic Rocks | Ch. 14 | Lab 12: Metamorphic Minerals |
| | | 4 | Metamorphic Rocks | Ch. 14 | |
| 15 | | 7 | Economic Minerals | Ch. 15 | |
| | | 9 | Economic Minerals | Ch. 15 | Lab 13: Metamorphic Rocks |
| | | 11 | Resources | Ch. 16 | |
| | | **16** | **Final Exam 8:10-10:10 AM** | | **12/17 Lab Final 10:10-12:10** |